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MONTANA ENERGY CONSERVATION PLAN

Working Paper No. 3

INDUSTRIAL ENERGY CONSERVATION

A Report to the

Montana Energy Advisory Council

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1. INTRODUCTION

Over the past decade Montana industry has been the fastest growing energy consuming sector.[1] Montana industry consumed 89.8 trillion Btu's of energy in 1974 or over 35 percent of total energy used in the state. Montana industry consumes over 40 percent of all natural gas sold within the state as well as over 60 percent of all electricity. This energy use is concentrated in a few basic industries (metal mining and processing, wood products and paper, oil refining, food products, and cement). For example, in 1974 the Anaconda Company and Hoerner Waldorf together consumed over 40 percent of all the natural gas distributed to industry. A detailed breakdown of Montana industrial energy consumption is given in Figures 3.1 to 3.5.

Montana's industries also have a substantial potential for energy conservation. Documented industrial conservation and fuel switching are expected to decrease Montana natural gas consumption by at least 8 billion cubic feet by 1980.[2] This decrease can be attributed to both the increasing price of natural gas and a potential gas supply shortage. Many more Montana industries are considering possibilities for natural gas conservation and fuel switching and industrial gas consumption is likely to be even further reduced in the future.

The Montana natural gas "crisis" has created an awareness of the potential for energy conservation in industry and a good climate for the implementation of conservation measures. Some industries have already initiated various energy conservation procedures. However, there are a number of additional possible measures which could supplement industrial conservation practices.

SIC	Industry	Natural Gas (mmcf) [1]	Percent of Total	Electricity (1000 kwhr) [2]	Percent of Total	Percent of Combined Energy [4]
	Mining					
10	Metal Mining	NA		377,870	6.5%	
12	Bituminous Coal and Lignite	NA		9,936	0.1%	
13	Crude Petroleum, Natural Gas	NA		205,415	3.5%	
14	Nonmetallic Mineral Mining	NA		45,790	0.8%	
	Subtotal Mining	3,367	9.0%	636,911	11.0%	9.7%
	Manufacturing					
20	Food and Kindred Products	1,270	3.4%	69,577	1.2%	2.6%
24	Lumber and Wood Products	900	2.4%	235,776	4.0%	3.0%
25	Furniture and Fixtures	363	1.0%	3/		0.6%
26	Paper and Allied Products	4,700	12.5%	151,047	2.6%	9.1%
27	Printing and Publishing	508	1.4%	6,414	0.1%	0.9%
28	Chemicals and Allied Products	1,100	2.9%	489,802	8.4%	4.8%
29	Petroleum and Coal Products	6,195	16.5%	311,767	5.4%	12.7%
32	Stone, Clay, Glass & Concrete	4,400	11.7%	81,704	1.4%	8.2%
33	Primary Metals	13,100	34.9%	3,829,054	65.9%	45.6%
34	Fabricated Metals	436	1.2%	58,334	1.0%	0.8%
35	Machinery (Non-electrical)	0	0.0%	34	0.0%	0.0%
36	Electrical Machinery	327	0.9%	402	0.0%	0.6%
37	Transportation Equipment	300	0.8%	0	0.0%	0.5%
39	Other Manufacturing	546	1.5%			1.0%
	Subtotal Manufacturing	34,145	91.0%	5,176,865	89.0%	90.3%
Total Mining and Manufacturing		37,512.	100.0%	5,813,777	100.0%	100.0%

NA = not available.

1/ Gas Requirements Committee, Future Gas Consumption of the United States, Volume 6, December 1975.

2/ Federal Reserve Bank of Minneapolis.

3/ Included with fabricated metals (34).

4/ Assumes 1000 BTU/cubic foot and 3,412 BTU/kwhr.

Figure 3.2.--Consumption of Natural Gas and Electricity by Mining and Manufacturing in Montana, 1974

Source: Terry Wheeling, "Consumption of Natural Gas and Electricity in Montana, Helena, Montana, Montana Energy Advisory Council, September, 1976.

	Natural Gas [1]		Electricity [2]		
Year	(billion cubic feet)	Increase	(million kwhr)	Increase	
1960	170		9,936		
1970	249	46.4%	26,776	169.5%	4.5%/yr
1971	272	9.2%	30,120	12.5%	6.1%/yr
1972	295	8.5%	33,559	11.4%	5.5%/yr
1973	325	10.2%	36,998	10.2%	5.3%/yr
1974	341	4.9%	38,089	2.9%	1.7%/yr
1975	355	4.1%	39,180	2.9%	1.7%/yr
1976	369	3.9%	40,271	2.8%	1.7%/yr
1977	384	4.1%	41,362	2.7%	1.7%/yr
1978	399	3.9%	42,453	2.6%	1.7%/yr
1979	414	3.8%	43,544	2.6%	1.7%/yr
1980	430	3.9%	44,635	2.5%	1.7%/yr
1981	446	3.7%	45,726	2.4%	1.7%/yr
1982	463	3.8%	46,817	2.4%	1.7%/yr
1983	480	3.7%	47,908	2.3%	1.7%/yr
1984	498	3.8%	48,999	2.3%	1.7%/yr
1985	516	3.6%	50,089	2.2%	1.7%/yr

Source: 1/ American Gas Association, Gas Facts, various years.
2/ Edison Electric Institute, Statistical Yearbook of the Electric Utility Industry, various years.

Customer	Location	SIC Code Major Group	Federal Power Commission Priority Numbers 1	2	2A	2R	4	3	6	7	8	9	Total
			(Mcf at 14.73 Psia)										
Annual Use By Priority													
Customers Using Over 36,720 Mcf Per Year													
Continental Oil	Billings	29	-	7,326	-	1,018,489	-	788,675	-	-	-	-	1,812,540
Exxon	Billings	29	-	158,448	-	101,652	-	-	-	-	-	-	260,100
Farmers Union Central Exchange	Laurel	29	-	-	-	1,050,703	-	928,097	-	-	-	-	1,978,800
Gary Operating	Bell Creek	13	-	-	-	135,363	-	-	-	-	-	-	135,363
Great Western Sugar	Billings	20	-	9,522	-	395,244	-	1,388,456	-	-	-	-	1,793,222
Holly Sugar	Sidney	20	-	3,306	-	510,774	-	913,920	-	-	-	-	1,478,000
Lovell Clay	Billings	32	-	455	-	58,705	-	-	-	-	-	-	59,160
Pierce Packing	Billings	20	-	78,540	-	122,400	-	-	-	-	-	-	200,940
Shell Oil (Little Beaver)	Lewis	13	-	65	-	96,019	-	-	-	-	-	-	96,000
Shell Oil (Pine Unit)	Baker	13	-	2,514	-	435,086	-	-	-	-	-	-	438,600
Tesoro Petroleum	Wolf Point	29	-	388	-	47,654	-	-	-	-	-	-	48,042
Midland Empire Packing	Billings	20	-	790	-	61,713	-	-	-	-	-	-	62,503
Shell Oil Water No. 117987	Baker	13	-	-	-	168,699	-	-	-	-	-	-	168,699
All Other Customers													
Algoa Linen Service	Billings	72	-	9,848	-	-	-	-	-	-	-	-	9,848
Atlantic Richfield	Belfry	13	-	47	7,543	-	-	-	-	-	-	-	7,590
Axsell	Billings	17	-	4,522	-	-	-	-	-	-	-	-	4,522
Big Sky Linen Supply	Billings	72	-	-	10,376	-	-	-	-	-	-	-	10,376
Billings Cattle	Billings	27	-	-	7,723	-	-	-	-	-	-	-	7,723
Billings Rendering	Billings	20	-	312	18,935	-	-	-	-	-	-	-	19,247
Central Feed Mill	Hardin	20	-	-	5,525	-	-	-	-	-	-	-	5,525
Online Check Printers	Billings	27	-	-	7,274	-	-	-	-	-	-	-	7,274
Eddy's Bakery	Billings	20	-	627	15,556	-	-	-	-	-	-	-	16,183
Elk River Concrete Products	Billings	32	-	186	11,533	-	-	-	-	-	-	-	11,719
Empire Steel Manufacturing	Billings	35	-	2,463	6,110	-	-	-	-	-	-	-	8,573
Farmers Union	Glendive	07	-	5,201	-	-	-	-	-	-	-	-	5,201
Farr Better Feeds	Billings	20	-	153	8,966	-	-	-	-	-	-	-	9,119
G.A.F. Servicenter	Sage	07	-	21,021	-	-	-	-	-	-	-	-	21,021
Hospital Laundry Services	Billings	72	-	9,109	-	-	-	-	-	-	-	-	9,109
Interstate Bakery	Billings	20	-	256	15,498	-	-	-	-	-	-	-	15,754
Midland Feeds	Billings	20	-	284	5,043	-	-	-	-	-	-	-	5,327
Midland Food	Billings	20	-	336	6,893	-	-	-	-	-	-	-	9,229
Midland Materials	Billings	20	-	1,199	15,802	-	-	-	-	-	-	-	17,001
Miles City Northwest Rendering	Miles City	20	-	351	4,800	-	-	-	-	-	-	-	5,151
Miles City Steam Laundry	Miles City	72	-	8,811	-	-	-	-	-	-	-	-	8,811
Montana Prestress	Billings	32	-	418	13,518	-	-	-	-	-	-	-	13,936
NP Heating Plant	Billings	49	-	6,959	-	-	-	-	-	-	-	-	6,959
NP Stationary Plant	Laurel	40	-	28,681	-	-	-	-	-	-	-	-	28,681
Peavey Elevator	Sidney	07	-	5,028	-	-	-	-	-	-	-	-	5,028
Peavey Flour Mills	Billings	07	-	4,889	-	-	-	-	-	-	-	-	4,889
Rex Laundry	Billings	72	-	12,624	-	-	-	-	-	-	-	-	12,624
Savage Shell	Savage	20	-	483	24,373	-	-	-	-	-	-	-	24,838
Sidney Rendering Plant	Sidney	20	-	373	5,887	-	-	-	-	-	-	-	6,260
Union Tank Car	Laurel	37	-	4,842	18,184	-	-	-	-	-	-	-	23,226
Western Beverages	Billings	20	-	2,421	5,151	-	-	-	-	-	-	-	8,572
Total Montana			-	323,644	216,892	4,201,203	-	4,018,148	-	-	-	-	8,832,287

From Stone & Webster Management Consultants, Montana-Dakota Utilities Co., End Use of Natural Gas, prepared for Montana-Dakota Utilities, March 1976.

Figure 3.4.--Montana Dakota Utilities Co. End Use of Natural Gas, Montana, Calendar 1975.

Source: Terry Wheeling, "Consumption of Natural Gas and Electricity in Montana," Helena, Montana, Montana Energy Advisory Council, September, 1976.

Company	1980 Gas Decrease (in mcf)	Explanation
Farmers Union	157,174	Conversion to electricity
Continental Oil	496,740	Conservation
Great Western Sugar	1,217,836	Conversion to coal
ASARCO	10,903	Conservation
Anaconda Co. (at Anaconda)	3,000,000	Conversion to electric furnace
C & C Plywood	62,949	Conversion to wood wastes
Louisiana-Pacific (particle board)	25,000	Conservation
Ideal Cement	1,891,000	Conversion to coal
Kaiser Cement	1,695,000	Conversion to coal
TOTAL 1980 SAVINGS	8,556,602	Represents 20 percent of 1975 industrial natural gas demand of Montana Power Co. and Great Falls Gas along with 30 percent of the MDU industrial demand

Figure 3.5.--Industrial Natural Gas Savings Planned in Montana by 1980.

Source: Thomas W. Frizzell, "Montana's Natural Gas Supply Crisis," Helena, Montana, Montana Environmental Quality Council, November 1976.

2. ENERGY MANAGEMENT

Efficient energy management is the keystone of industrial energy conservation and energy auditing is the first step toward efficient energy management. The United States Department of Commerce and several industrial trade associations are in the process of developing energy auditing methodologies.[3] A draft energy auditing procedure has been published by the United States Department of Commerce and could be implemented by industry. Energy auditing would indicate, in a systematic fashion, exactly where and how much energy is consumed in an industrial process. The audit would likely reveal areas where energy could be more efficiently used. Energy audits are being conducted by industries all over the United States, and energy savings of at least 10 to 15 percent have been reported in certain instances simply by implementing housekeeping and other cost effective conservation measures. Cost effective conservation measures would likely be soon implemented by industry; however, state incentives or regulation could possibly speed implementation.

2.1 Recommendations

Each industry in the State of Montana should conduct an energy audit. The results of the audit should be available to appropriate public officials. Following are possible implementation strategies.

1. The State of Montana could offer tax incentives to companies that perform energy audits.

2. State personnel could be made available to industry to perform energy audits. The state could create the position of energy auditor who could work with industry upon invitation or be required by law to conduct energy audits.

3. The state energy office could conduct an educational campaign to inform industry about the benefits of energy auditing.

4. The Montana Public Service Commission could require the submission of an energy audit.

Energy audits should be followed up to insure that areas of potential conservation disclosed by the audit are studied and implemented where feasible. The following are possible implementation strategies.

1. Let the economic system and the marketplace work.

2. Offer tax incentives for capital investment in energy conservation.

3. The Public Service Commission use the energy audits as the basis for an emergency energy allocation plan.

2.2 Evaluation

Energy auditing is technically feasible. Energy audits are being conducted all over the United States. For example, the Anaconda Company has created the position of energy manager for its Montana Mining Division and has conducted very detailed energy audits. Energy auditing is economically feasible. It will save money for Montana industry by defining areas where excessive energy consumption is occurring. Energy auditing probably will have minimal employment impact; however, energy conservation related purchases could add some economic stimulus.

On May 30, 1975, the Montana Public Service Commission exercised its emergency rule making authority by ordering natural gas utilities to prepare (in conjunction with major industrial and commercial gas users) energy conservation plans for improving the efficiency of energy usage by those large customers. If a utility customer did not file an emergency conservation plan by a specific date or if their plan was deemed insufficient

by the commission, the commission then could impose a monthly penalty curtailment of natural gas up to ten percent of the amount used by the offending customer during the same month of the previous year. This emergency order actually was not served upon utilities until September 1975. Under the Montana Administrative Procedures Act, the commission was required to conduct a hearing on this emergency order within six months of its imposition. During this time, there was no formal compliance by the utility companies nor by their major natural gas customers. In February 1976, this emergency order expired through default when the commission decided not to conduct the mandatory public hearing.

The need for an accurate audit of how natural gas and electricity are used by large industrial and commercial customers is more pronounced in 1977 than it was in 1975. Significant curtailments of industrial interruptible gas supplies are forecasted for the immediate future, and there are indications that the Bonneville Power Authority may begin to reduce electric power sales to large industrial customers in northwest Montana. With the severe weather conditions in the eastern United States and federal considerations of emergency allocation of interstate natural gas supplies, Montana should prepare a comprehensive emergency energy conservation plan which would minimize the economic disruptions of statewide or national energy emergency.

We recommend that the Montana Public Service Commission order all utility companies and their major industrial and commercial customers to immediately prepare detailed evaluations of energy use in their operations and to prioritize those energy needs according to the basic minimum requirements of each customer. These energy audits should be submitted to

the Public Service Commission for review and inclusion in a statewide emergency energy allocation plan.

3. CO-GENERATION OF ELECTRICITY

Many industrial processes produce steam. In the early 1900's, the generation of electricity from this steam was a common practice. However, by 1968 industry in the United States generated only 17 percent of its electricity requirement.[4]

A recent report by the Dow Chemcial Company indicates that United States industry is currently utilizing only about 30 percent of its available steam base for by-product power generation.[5] The total development of this steam base would not wholly supply indstries' electrical needs. However, with the additiona of incremental capacity for additional condensing power generation, industry could supply all of its own power and even produce power beyond its needs for distribution by local utilities. The Dow study indicates that this power could be economically developed.

Industries that appear to be particularly suited for by-product power generation include refineries, pulp mills, and chemical plants. The Dow study specifically noted that the Hoerner-Waldorf pulp mill west of Missoula could potentially generate 35 MW of power.

3.1 Recommendations

Industires in Montana should undertake studies to determine the technical and economic feasibility of the co-generation of electricity and process steam. Following are possible implementation strategies:

1. Tax incentives could be granted to industries for co-generation feasibility studies.
2. The state could undertake an educational campaign to inform industries about the potential economic benefits of co-generation.

3. The Montana Public Service Commission could determine co-generation potential based on industrial energy audits.

The Montana Legislature and the Public Service Commission should also insure that industries have the legal right to generate their own power and the ability to sell excess power to utilities for distribution in existing power grids.

3.2 Evaluation

Co-generation of electricity is technically feasible and is currently accomplished by a number of industries in the United States and by the Hoerner-Waldorf corporation in Montana. By-product power generation will result in significant fuel savings for utilities and appears to be economically attractive for many industries. Co-generation should have a positive environmental impact since the fuel burned to raise industrial steam will serve a dual purpose and replace fuel that would be used by a utility to raise steam for electrical generation.

Since the mechanical and thermal energy of the steam used for industrial generation of electricity is applied subsequently to other industrial processes, the total end use efficiency of the raw source energy is substantially higher than those conversion efficiencies characteristic of central electric generating stations. By implementing conversion technologies which increase end use efficiencies, industrial co-generation can accomplish multiple purposes with a given amount of fuel, thus avoiding the need for redundant and thermodynamically less efficient electric generation capacity in the utility system.

With thorough auditing of each industry's energy consumption and specific energy requirements, the technical feasiblity of co-generation can be determined for specific facilities or processes. The existing utility rate schedules for industrial users provides electric power at costs far below the average cost to residential and commercial users and even farther below the marginal costs of new electric power capacity. As these utility rates are evaluated and possibly revised, the economic feasibility of industrial co-generation also may be enhanced as the most cost effective investments in power supply are identified.

We recommend that the Public Service Commission analyze the potential for industrial co-generation as determined from the detailed energy audits to be submitted in compliance with the state's emergency energy allocation plan. The commission also should assess whether the "Electric Supplier's Territorial Integrity Act of 1971" (70-501 RCM) prohibits industrial or commercial co-generation of electric power. This law provides that "...an electric utility shall have the right to furnish electric service to any industrial or commercial premises if the estimated connected load for full plant operation at such...premises will be 400 kilowatts or larger within two years from the date of initial service.." (70-503(3) RCM).

A final issue deserving the commission's attention is whether existing electric utilities should be required to enter into purchased power contracts with those industries whose co-generation capabilities exceed their own private electric requirements. In those cases where the co-generated electricity is reliably available at a cost less than what the utility company could provide from its own facilities, the utility should show cause why it would refuse a co-generated electric sales offer. In lieu of

this requirement, the designation of common carrier status for fixed energy utilities should be reviewed for its impact on improving the marketability of electric power generated by industry within Montana.

4. ENERGY CONSERVATION IN NEW INDUSTRY

It is usually significantly less expensive and more economically efficient to implement energy conservation procedures in new industry than to retrofit existing industry. In most industries new processes have been developed which are definitely more energy efficient than existing processes. It is clearly in the best interest of the State of Montana to insure that new industry locating in the state or the expansion of existing industry is energy efficient.

4.1 Recommendation

The state should insure that new industry is energy efficient. The state could require that an energy efficiency justification be included in the environmental impact statement for any new industry or expansion of existing industry. Such justification would include life cycle or total energy costs of the selected process/procedure and discarded alternatives. Gross energy inefficiency could be grounds for permit denial.

4.2 Evaluation

The promotion of energy efficient industry is an important state goal. The environmental impact can be positive since reduced fuel consumption will generally mean lessened environmental residuals. However, care must be taken to avoid compromising environmental protection for energy efficiency.

The social good of environmental protection has to be weighed along with energy conservation.

Optimizing energy efficiency means choosing pollution control devices that minimize energy consumption not the elimination of pollution control devices for the sake of conserving energy. Similarly industrial fuel substitution should be weighed against the environmental impacts of the alternative fuel. State implementation of energy conservation requirements will require some additional time requirements for state personnel that prepare environmental impact statements but the incremental additional expense probably would not be significant. The legal implications and requirements of this recommendation have not yet been explored.

5. CAPITAL AVAILABILITY FOR INDUSTRIAL ENERGY CONSERVATION MEASURES

There are a number of energy conservation procedures that could be implemented on an industry by industry basis. Each plant is a separate case and the cost of conservation measures are different for every plant. For example, the average industrial furnace achieves an efficiency for steam production of about 70 percent.[6] Direct heating processes have even lower efficiency, sometimes as low as 20 percent. Through boiler modification to improve heat transfer efficiency, 10 percent of the boiler energy can be saved.[7]

The Ford Foundation Energy Policy Project specifically studied the energy conservation potential in six United States industries.[8] The study concluded that these industries, iron and steel, petroleum refining, paper, aluminum, copper, and cement could reduce their specific fuel consumption by one-third using existing technology. New technologies being developed could reduce energy consumption in these industries much further.[9]

These industrial conservation measures do require a considerable capital investment. While the return on investment for conservation procedures is often substantial, industrial capital availability may be a problem.

5.1 Recommendation

The State of Montana could assist industry in raising capital for energy conservation capital investment. Following are the possible implementation strategies.

1. Montana counties could offer bonds for capital investment in industrial energy conservation. The program would be conceptually similar to the current program for bonds for air pollution control equipment.

2. The state could offer tax incentives for capital investment in energy conservation.

5.2 Evaluation

The effectiveness of state incentives for industrial energy conservation capital investment needs to be studied. Industry may be wary of specific state involvement and requirements for raising capital. Also the actual "incentive" that a state may offer for raising capital may not actually be a determinant in an industry's decision to invest in energy conservation equipment. In other words the incentive may give a tax break and cost the state money for something that industry would do anyhow. Or conversely, the size of incentive that a state could offer may not be large enough to spur any additional capital investment. In summary, any incentive plan to aid industry in raising capital needs to be evaluated carefully.

6. MANDATORY ENERGY CONSERVATION

The State of Montana could simply mandate that industry conserve energy. In 1975 the Montana Public Service Commission issued an emergency order which required all large industrial and commercial users to reduce their overall gas consumption by 10 percent. Industries were required to submit accomplishment plans to the Public Service Commission and failure to conserve energy resulted in severe penalties. This action was never fully implemented in Montana, but precedent for this type of action exists in other states. Actions in Los Angeles, California being a specific example.[10] The effectiveness of regulations of this type can certainly be debated and they certainly penalize an existing energy efficient industry.

7. ENERGY RATE STRUCTURES

It is well known that at least to a degree the demand for a specific fuel is sensitive to the cost of that fuel. The cost of fuels in Montana are determined by the Public Service Commission. Industry has traditionally paid lower prices for energy than residential or commercial customers. This structure is based on a cost of service argument (it costs less to deliver large quantities of energy to a single customer than it does to deliver small amounts of energy to a large number of residential or commercial customers) and interruptible service. (Industry has lowest priority when deliverable quantities of energy are limited.) Rate structures can definitely be designed to stimulate energy conservation.

The entire question of industrial rate structures is a very complex issue that is also interrelated with the residential and commercial sectors. It is an area that requires detailed study, but it is the responsibility of the State of Montana to insure that industry pays its fair share for its energy supplies.

A recent editorial in Business Week, November 29, 1976, reproduced on the next page presents an interesting industrial argument for energy rate reform.[11]

MORE SHOULD COST MORE

"The renewed upswing in the demand for power and the rapid rise in electrical bills brings the faults of the typical U.S. utility rate structure into sharp focus (page 55). The traditional formulas that arbitrarily assign lower rates to big power users are working against the common-sense demand for energy conservation. Instead of rubber-stamping rate increases, the state utility commissions should make rate structures correspond to the cost of service, thus narrowing the gap between industrial and residential use.

Reform should be based on sound economics, not on popular pressures. The more zealous reformers have been arguing for flat rates—uniform charges for all users regardless of how much they buy. Some have even called for lower rates for small users. But such proposals ignore the fact that it costs a utility less to serve a single big customer than an army of small ones. Distorting the rate structure to favor the small user would artificially increase the costs of big, efficient power users and tilt the economy toward inflation.

Instead, the state regulators should try to restructure rates so that bills reflect the incremental cost that each customer imposes on the system. These so-called marginal cost pricing schemes are complex, but they offer too many advantages—both in equity and in economic impact—to be brushed aside.

Marginal pricing would subject power consumption to the discipline of the market mechanism. Since unit costs today tend to rise with each new addition to a system's capacity, there is no longer any economic justification for promotional rates. Rate reform, no matter how skillfully done, will not lead to lower utility bills for all. But rational reform would prevent a blind, costly expansion that would skyrocket all rates in the future."

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APPENDIX A

"Bigger Electric Bills Ahead for Big Business"

Business Week: November 29, 1976, pp. 55-56

Bigger electric bills ahead for big business

After a decade of dawdling, the nation's electric utilities have finally begun to reform their outmoded formulas for establishing electricity prices. Last year California adopted a "lifeline" rate designed to provide low-income families with a bare minimum of electricity at a fixed, budget rate. Utilities elsewhere are implementing peak pricing systems, one rate for slack periods and another for periods of intense demand.

Now, thanks to the prospect of a sympathetic new occupant in the White House, growing interest in Congress, and increasing enthusiasm at the local level, rate reform is about to become a major national issue. In most cases, the outcome will mean higher electric bills for big business.

The prime target of reform will be the traditional "declining block" rate structure, by which large users pay less per kilowatt-hour than small users. Though

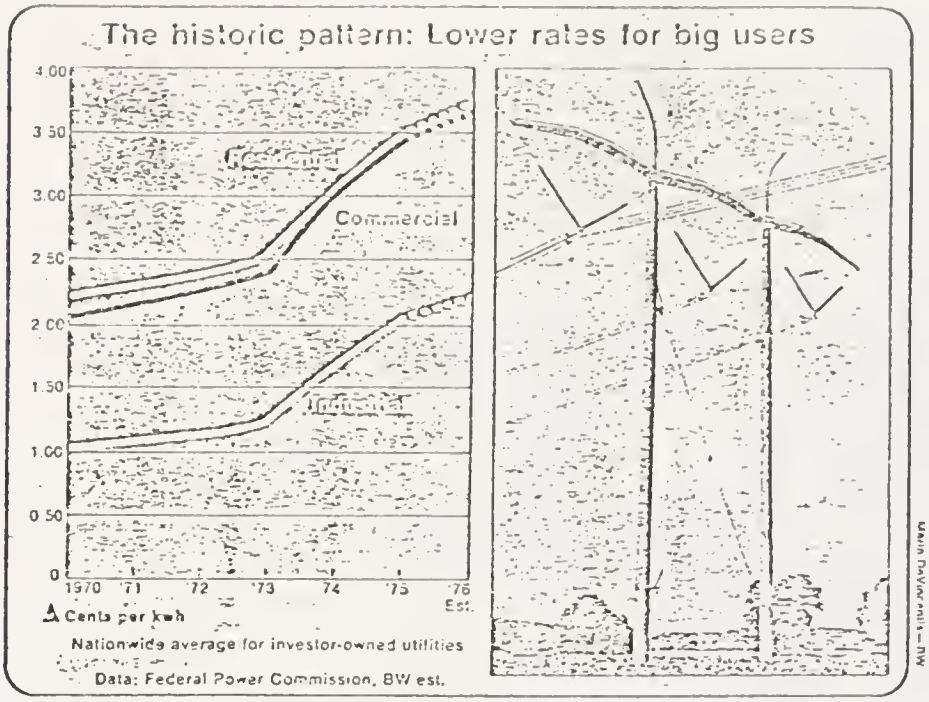
Rate reformers aim to narrow the gap between big and small consumers

lopsided pricing makes some economic sense, in the past the spread has been decided rather arbitrarily. "Utilities or regulators just sat down with the big customers and asked them how much of an increase they could handle," says Irwin M. Stelzer, president of National Economic Research Associates, a consulting firm used by many utilities. "Then," he adds, "if utilities needed more money, they just raised rates for commercial and residential customers."

Stimulating growth. Certainly, one justification for the more-costs-less approach is that it does, in fact, cost less to supply a big factory, which may provide its own transformers and other equipment, than to service a host of households consuming the same amount of power. But the primary motivation has been to promote growth. By luring big industrial customers to their systems, utilities were able to benefit from both economies of scale and advancing technology, making electricity cheaper for all. As a result power rates continually dropped right through the mid-1960s.

But then technological improvements leveled off and economies of scale reached the vanishing point. Expanding a utility system started adding to unit costs, not reducing them. Next came the Arab oil embargo, a fourfold runup in fuel prices, and a new round of inflation and high interest rates. All in all, electricity rates nationwide have shot up 75% since 1969, and this has whipped up the industry's critics and widened the call for reform.

Rate reform was originally a goal of environmentalists, who wanted to reverse the declining block rate structure to encourage conservation. Some still argue for inverted rates, but today most reformers realize that switching to a more-costs-more pricing schedule could have disastrous economic consequences. Instead, the more radical reformers these days call for flat rates—the same charge per kwh regardless of the amount of power bought. But even these proposals are meeting resistance. Earlier this month voters in Massachusetts turned down a flat-rate referendum by a 3-to-1 margin.



So serious reformers these days are concentrating on a complex scheme known as marginal cost pricing (MCP). In its purest form, a marginal cost system would charge each customer based on the actual added cost that his usage imposes on the utility. The power company would first calculate how much each customer adds to its operating costs. Then it would anticipate how its system must be expanded to meet growing demand and charge all customers in proportion to their contribution to that expanding demand.

Seeking proposals. Although few experts believe MCP can be implemented in its purest form, advocates of reform want utilities to move as far along in that direction as possible, and they are starting to see some results. Hearings have been held in Florida, though officials there have taken no action yet. Hearings are now scheduled in Pennsylvania, Illinois, Missouri, and Colorado, and utility commissions in Massachusetts, Connecticut, Maryland, North Carolina, Ohio, and California are also considering MCP. Wisconsin has adopted some of the simpler elements of MCP, and the New York Public Service Commission has ordered all utilities in that state to come up with comprehensive proposals for working MCP into their rate schedules.

New York's move to MCP is led by Alfred Kahn, head of the state's utility commission. Kahn expects to rule on the nation's first encompassing MCP plan—for Long Island Lighting Co.—by Dec. 1. As he sees it, MCP will first be implemented for large industrial users in New York, then for commercial consumers, and finally for residential customers.

At the direction of Congress, the Federal Energy Administration is currently evaluating MCP, and its report should be completed in February. FEA staffers say the agency likes the concept but in the last few weeks has become concerned about the difficulties in implementing it. Still, even a lukewarm appraisal would probably encourage Representative John D. Dingell (D-

A glossary of rate reform proposals

Schemes that encourage conservation

Inverted rates
The more power you buy, the higher the rate—the reverse of the traditional rate structure. Proposed by environmentalists as a way to encourage conservation, but not yet fashionable.

Lifeline rates
The first, say, 300 kwh of power you buy in a year is provided at a below-cost rate—designed to help the poor. California adopted a lifeline rate last year.

Flat rates
The rate is the same no matter how much or how little power you buy. Soundly defeated in a recent Massachusetts referendum.

Schemes based on cost of service

Marginal-cost pricing
The rate reflects the true cost of the service provided, as determined by a complex formula. Many utilities like the theory, but some complain that the formulas will be unwieldy in practice.

Time-of-use pricing
A type of marginal-cost pricing. The rate is higher during peak demand periods when it costs more to provide power. Many utilities have seasonal surcharges; a few are trying time-of-day premiums.

Interruptible rates
The rate is cheaper if you agree to do without power when the utility is pressed. Some utilities provide such rates for industrial customers; reformers want them for residential consumers, too.

Mich.) to press for a review of MCP and other rate reforms by the House energy and power subcommittee, which he chairs. Dingell was not successful in writing rate reform into law in the current congressional session, but he says he will try again, and support is growing among his colleagues. Moreover, President-elect Carter has publicly called for rate reform.

Pressure groups. Meanwhile, industry is grouping its forces. A group of 11 energy-intensive manufacturers have formed a lobbying organization called the Electricity Consumers Resource Council (ELCON) to represent industry's interest in the issue. ELCON says it favors cost-of-service pricing, but it is nonetheless wary of MCP. "As a blackboard theory, marginal pricing seems reasonable enough," says George L. Cobb, energy affairs director for PPG Industries Inc., an ELCON member. "But its implementation in ratemaking presents a tangled web of problems. It requires rather accurate projections of demand, inflation rates, and operating costs, just to mention a few considerations."

ELCON is also concerned that as utility commissions shuffle rates to reflect MCP, they might cave in under pressure from consumer groups and shift a disproportionate share to industrial users. Another problem is that under MCP, utilities would have excess revenues on hand earmarked for expansion, and that could prove politically untenable when they seek further rate increases.

But proponents of MCP hold their ground. "I don't pretend that difficulties do not exist," says Kahn. "But once you understand it—and once you understand its benefits—the problems don't seem that insurmountable." Kahn argues that MCP will provide a clear signal to users that they should avoid unnecessary consumption, because those who increase their demand will have to bear the additional costs needed to generate the extra power. Under existing rate schedules, rising electricity bills do provide some warning, but since higher, incremental costs are averaged with lower, existing costs, the signals are not as strong. Accordingly, users are not fully motivated to cut consumption. "Think about a customer who wants to put in insulation," says Kahn. "Right now he must finance at current costs while his saving is in old prices."

In marginal cost pricing, charges are based on the actual cost to the utility

Other experts readily second Kahn's enthusiasm for MCP. "There are too many advantages to ignore it," says consultant Stelzer, who advises utility executives to go along with marginal pricing. "The ultimate result will be a superior allocation of resources."

Peak times. While the debate goes on, at least one aspect of MCP—time-of-use pricing—is fast catching on. It even has the endorsement of the Edison Electric Institute, trade association for the privately owned utilities. It costs more to generate the last few kilowatts of power that a utility can produce than the first few kilowatts. Reason: During peak demand periods, power companies must crank up their oldest and least efficient generators. Moreover, if a utility can improve its load factor—that is, distribute demand more evenly—it can make greater use of existing plants and may avoid building some new ones.

Both Wisconsin and New Jersey have had peak pricing schemes for many years, and today some form of time-of-use pricing exists in about half the states. Most utilities merely take into account seasonal fluctuations—higher rates during peak demand months, usually summer. But some are even trying time-of-day variations. In an experimental program, Detroit Edison Co., for example, is charging some residential customers 2¢ per kwh between 9 p. m. and 9 a. m. and on weekends. At all other times they pay 6¢. Other consumers pay a constant rate for power, about 3.6¢ per kwh. A few other utilities are also experimenting with time-of-day pricing. One drawback: Time-of-day meters are very expensive.

The other side of time-of-use pricing is interruptible rates—cheaper rates for customers who agree to do without power when their utility is pressed. Interruptible rates are currently offered to industrial users by private utilities in 15 states, mostly in the East, as well as by the Tennessee Valley Authority and the Bonneville Power Administration. Rate reformers would now like to see interruptible rates offered to residential customers, too.

Reducing rate disparity. Reformers are also pushing for more states to adopt the lifeline concept implemented last year by California. With this scheme, utilities offer a "lifeline" allotment of electricity, say 300 kwh a month, at a fixed, low rate. But as MCP becomes more and more prevalent, state regulatory commissions are beginning to back away from lifeline rates. "If the objective is to offer low-cost service to the poor or to those on fixed incomes," notes economist Caroline Smith of the Texas Public Utility Commission, "lifeline rates are not the best way. You miss between 30% and 50% of these people, because they are actually big consumers."

Still, many regulatory agencies and utilities are clearly moving to reduce the disparity between the rates paid by big industrial users and the rates paid by small businesses, homeowners, and apartment dwellers. "There's a big trend in this direction," says Sarkis Soultanian, executive vice-president of National Utility Service Inc., a consulting company that advises businesses how to get the best utility rates. He claims that rates in Maine, Vermont, New York, Michigan and Florida already reflect this trend, even though nationwide averages do not. "And in the future," predicts Soultanian, "I have no doubt that we will see flatter and flatter rates." ■